DECISION SUPPORT SYSTEM FOR TREATMENT OF DREDGED SEDIMENTS

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SUMMARY
A decision support system for treatment of dredged sediments (DSTS) has been constructed, in which the environmental effects of various treatment options applied can be compared. The effects are evaluated by scores on environmental themes like global warming and acidification, using life cycle assessment methodology.

INTRODUCTION
Millions of tons of less or more polluted sediments are being dredged in the Netherlands annually. These dredgings result from routine maintenance of waterways for shipping and water supply, as well as from remediation of polluted sediment sites. Until recently the only outlet for this polluted material was dumping in storage depots. As a result of several research programmes that have been completed over the last decade, a number of separation and cleaning techniques have become available for treatment of polluted sediments.
Different water authorities, charged with responsibility for dredging activities, have to decide how to handle the dredged material. In order to make the right decisions and to take into account new treatment methods, the authorities and their advisors require information concerning possibilities and impossibilities of specific treatment methods in the given situation, and concerning the environmental effects of these treatment methods. The 'Decision Support system for Treatment of dredged Sediments' (DSTS) aims to present the information required.

SYSTEM DESCRIPTION
Based on a flexible database filled with information on the different individual treatment techniques, the DSTS judges which chains of techniques can be applied for the specific dredged material under question. First, a number of potentially applicable chains are selected. Next, each chain is analysed in order to predict the composition of the different resulting products and to quantify the expected environmental effects and the amount of waste. The quantification of the effects is accomplished by the use of the 'LCA" (Life Cycle Assessment) methodology. The use of scarce commodities, emissions, etc. for the various processes is converted into scores on a limited number of environmental themes, like global warming, acidification, smog formation, etc. Next, the scores are normalised using the total volume of the issue under consideration in the Netherlands. Optionally (using more or less subjective weight factors) the scores can be combined into a single number as an indication of the environmental sacrifices.

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OUTPUT

The output is presented in tabular and graphical form. An example of a so-called

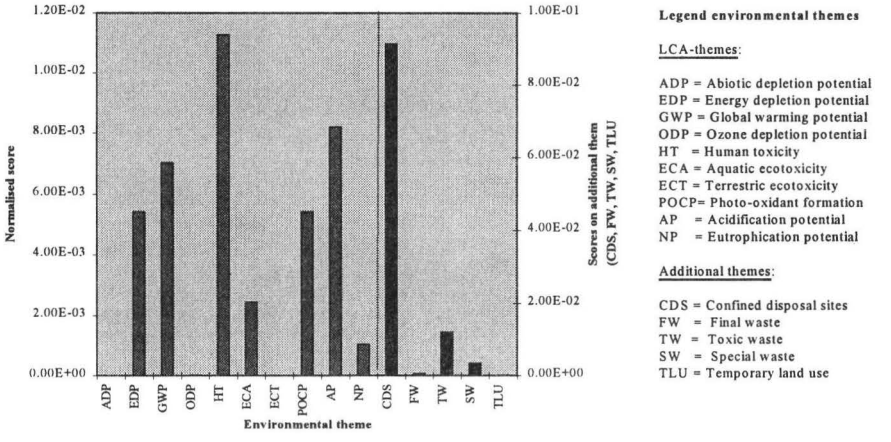

Figure 1 Environmental profile (fictive case)

'environmental effects profile' for a fictive case is presented in figure 1. This figure shows the normalised scores on the environmental themes considered.
Comparison of the output for different treatment options provides information that can assist the water authorities in making decisions. The rough cost figures, that are presented in the output as well, can assist in serving this purpose. Limiting conditions based on legislation and physical and environmental planning, however, are not part of the DSTS.

PROSPECTS

The DSTS is available as a prototype for testing at present. New treatment techniques and new chains of techniques can be added to the system database and technique information can be changed, based on recent research results or practical experience. With this new information predictions will become more and more reliable.
Preliminary tests have proven the potential of DSTS as a useful tool within the field of sediment management. Nevertheless, more techniques and further details concerning the treatment techniques already incorporated have to be added to the database, before the system can be presented as a tool to be used more widely. For the next decade limitations in possibilities for sediment storage in depots will urge the water authorities to search even more for alternative solutions to handle the removed polluted sediments. Based on this expectation, the further development of the DSTS should take place in close co-operation with the intended users.
One of the challenges to be met is the development of a consistent and reliable method for the assessment of environmental effects of in-situ sediment (before and after dredging), in order to visualise also the benefits of a dredging operation. By offering this option the system will be suited for use in prioritisation of sites to be remediated. In order to achieve this, risk analysis methods will have to be combined with the LCA-methodology for the assessment of the environmental effects.